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[0001]RADIO NETWORK CONTROLLER PEER-TO-PEER EXCHANGE OF USER EQUIPMENT MEASUREMENT INFORMATION

[0002] CROSS REFERENCE TO RELATED APPLICATION(S)

[0003] This application claims priority from U.S. provisional application no. 60/392,122, filed June 27, 2002, which is incorporated by reference as if fully set forth.

[0004] FIELD OF INVENTION

[0005] This invention relates to wireless communication systems. In particular, the invention relates to the transfer of information between radio network controllers in such systems.

[0006] BACKGROUND

[0007] Figure 1 is an illustration of a wireless communication system where all the users are handled by a radio network controller (RNC) 20. Each user, wireless transmit/receive unit (WTRU) 24, wirelessly communicates with a Node-B 22_1. A group of Node-Bs 22_1-22_2 are controlled by the radio network controller (RNC) 20.

[0008] As the WTRU 24 moves, the WTRU 24_1, 24_2 is handed off between base stations/Node-Bs 32, 34. Figure 2 is an illustration of a WTRU 24_1, 24_2 moving from an area handled by a first RNC 28 to an area handled by a second RNC 26. The WTRU 24_2 is considered to have "drifted" into the new RNC's region and that RNC (the second RNC) is considered the drift RNC (D-RNC) 26. The D-RNC 26 has Node-Bs 32, which it controls. The first RNC is referred to as the servicing RNC (S-RNC) 28. Typically, the RNCs (S-RNC 28 and D-RNC 26) can communicate some information to each other over a RNC interface (Iur). After the WTRU 24_2 "drifts" to the D-RNC 26, the D-RNC

26 performs functions, such as dynamic channel allocation (DCA), admission control, scheduling and RRM functions for the "drifting" WTRU 24_2. The S-RNC 28 still performs other functions for the "drifting" WTRU 24_2, such as handoff decisions and collecting of WTRU downlink measurements. When the WTRU 24 has not "drifted", such as in Figure 1, the RNC 20 handling the WTRU 24 performs the functions of both the S-RNC 28 and D-RNC 26.

[0009] Under the R99, R4 and R5 Iur specifications as proposed for the third generation partnership project (3GPP), when the WTRU 24_1, 24_2 is handed over from the S-RNC 28 to the D-RNC 26, cell loading and many Node-B measurements are sent from the S-RNC 28 to the D-RNC 26. However, there is no mechanism to transfer certain information from the S-RNC 28 to the D-RNC 26, such as the WTRU measurements.

[0010] Accordingly, it is desirable to have better peer-to-peer communications between RNCs.

[0011] SUMMARY

[0012] A drifting wireless transmit/receive unit (WTRU) has an associated drift radio network controller (D-RNC) and an associated servicing radio network controller (S-RNC). The D-RNC sends a request message to the S-RNC requesting measurements of the drifting WTRU. The S-RNC receives the request message and sends an information message with the requested measurements to the D-RNC. The D-RNC receives the information message.

[0013] BRIEF DESCRIPTION OF THE DRAWING(S)

[0014] Figure 1 is an illustration of a RNC handling a WTRU.

[0015] Figure 2 is an illustration of a WTRU drifting between RNCs.

[0016] Figure 3 is a block diagram of a preferred embodiment for peer-to-peer information exchange.

[0017] Figure 4 is a flow chart of a preferred embodiment for peer-to-peer information exchange.

[0018] DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT(S)

[0019] Although the preferred embodiments are described in conjunction with a third generation partnership program (3GPP) wideband code division multiple access (W-CDMA) system, the embodiments are applicable to other wireless communication systems.

[0020] Hereafter, a wireless transmit/receive unit (WTRU) includes but is not limited to a user equipment, mobile station, fixed or mobile subscriber unit, pager, or any other type of device capable of operating in a wireless environment.

[0021] Figure 3 is a simplified block diagram of a S-RNC 40, a D-RNC 38 and an IUR 36 for a "drifting" WTRU 24_2 using peer-to-peer information exchange. Figure 4 is a flow chart of peer-to-peer information exchange. The S-RNC 40 typically performs functions such as handoff decisions and collecting of WTRU downlink measurements for the "drifting" WTRU 24_2. The D-RNC 38 typically performs functions such as DCA, admission control, scheduling and RRM functions for the "drifting" WTRU 24_2.

[0022] The D-RNC 38 has a RRM 42. The RRM 42 controls the resources for the WTRUs of cells associated with the D-RNC 38. The D-RNC 38 collects uplink measurements for the cell of the "drifting" WTRU 24_2 as well as other cells using an uplink measurement collection device 44. These measurements are available to the RRM 42 for use in resource allocation and management. The RRM 42 also has information for WTRUs that it is performing S-RNC functions.

[0023] The D-RNC 38 has logic associated with the RRM 42. When the RRM 42 requires downlink measurements of the "drifting" WTRU 24_2 or a group or WTRUs, the logic 46 initiates a WTRU measurement request device 48 to send a message through the Iur 36 for such information, step 60.

[0024] Examples of the information that may be requested by the D-RNC 38, include downlink common control physical channel (CCPCH) received signal code power (RSCP), interference signal code power (ISCP) measurements and/or traffic volume measurements. Preferably, the D-RNC information request messages can not request the WTRU 24_2 to make and send measurements, but the D-RNC 38 requests such measurement information currently available at the S-RNC 40.

[0025] The signaling messages on the Iur 36 allows any D-RNC 38 to initiate information exchange with S-RNCs on an individual WTRU, groups of WTRUs or WTRUs present in one or more cells for which it does not assume itself the role of an S-RNC. This procedure is preferably not a simple "forwarding" of WTRU-specific information, such as WTRU measurements. Preferably, the D-RNC logic 46 generally makes the decision of the type of information to request, although the logic function 46 may be performed by the controlling RNC (C-RNC). A logic function 46 in the D-RNC 38 decides if and when it will request measurements to be forwarded from the S-RNC 40. For example, if the D-RNC 38 detects that more than a threshold number or percentage, such as10%, of its WTRUs are in "drift" mode, it would typically start requesting measurements to be forwarded. In the preferred implementation, existing information elements and standardized WTRU measurements/reporting mechanisms defined by the 3GPP standard for Node-B interface (Iub)/Iur are utilized.

[0026] One preferred message allows the D-RNC 38 to request measurements for a particular "drift" WTRU 24_2 for a given time frame or for all the "drift" WTRUs in a given cell or group of cells associated with the S-RNC 40 for a given time frame. One scenario that requesting a group of WTRUs information is desirable is when many WTRUs having a particular S-RNC are in "drift" mode. For example, a first train station is supported by a first RNC and a second train station by a second RNC. All of the WTRUs boarding a train starting at the first station and departing at the second station may have the first RNC as the S-RNC 40 and the second RNC as the D-RNC 38. In this scenario, requesting WTRU information for the group of "drifting" WTRUs

reduces the messaging overhead. However, a scenario where the procedure allows only a single WTRU per message may be used, with increased messaging overhead.

[0027] The message is received by the "drifting" WTRU's S-RNC 40, step 62. That S-RNC 40 has a WTRU measurement collection device 52. The WTRU measurement collection device 52 stores the particular WTRU's downlink measurements. A WTRU measurement response device 50 sends a measurement/information message to the D-RNC 38 through the Iur 36, step 64. The D-RNC RRM 42 uses these measurements in its resource allocations and management, step 66. One benefit of transferring such data through the IUR 36 is such data transfer is typically quite fast.

[0028] One preferred approach for requesting and transferring the WTRU measurements uses the radio network sublayer application part (RNSAP) procedures. RNSAP has four basic modules. One of these modules is the "Global Procedures" module. That module contains procedures that involve signaling for exchange of cell level information between RNCs. For example, received total wide band power, load and global positioning system (GPS) timing information is exchanged using the Common Measurement messages.

[0029] The list of information exchanged using RNSAP Global Procedures is expanded to allow for better RRM. In particular, this information aids primarily handover decisions. For example, information associated with cell biasing of handovers to neighboring RNCs would aid in such decisions. In the proposed 3GPP system, the information exchanged using the Global Procedures module is not related to a particular WTRU or group of WTRUs. As a result, it does not support the transfer of WTRU data transfer across the Iur 36. Preferably, information should transferred across the Iur 36 using RNSAP procedures, if the analogous cell information is available in the S-RNC 40 for relevant RRM decisions by the D-RNC 38.

[0030] Such information exchange over the Iur 36 allows a D-RNC 38 to request WTRU measurement information from the S-RNC 40 and allows more cell information

to be exchanged between peer RNCs using the RNSAP Global Procedures module. Typically, this exchange of information enhances the performance of RRM algorithms (DCA, Admission Control, Scheduling and others) in the D-RNC 38, due to the availability of WTRU measurements. Enhanced RRM, especially DCA, facilitates performance, efficiency and robustness in wireless systems, such as the time division duplex (TDD) mode of 3GPP.

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